



# Volunteer Lake Assessment Program Individual Lake Reports

## PARTRIDGE LAKE, LITTLETON, NH

### MORPHOMETRIC DATA

Watershed Area (Ac.):	896	Max. Depth (m):	15.8	Flushing Rate (yr <sup>-1</sup> )	0.6
Surface Area (Ac.):	104	Mean Depth (m):	5.8	P Retention Coef:	0.71
Shore Length (m):	4,500	Volume (m <sup>3</sup> ):	2,434,000	Elevation (ft):	846

### TROPHIC CLASSIFICATION

Year	Trophic class
1992	MESOTROPHIC
2006	MESOTROPHIC

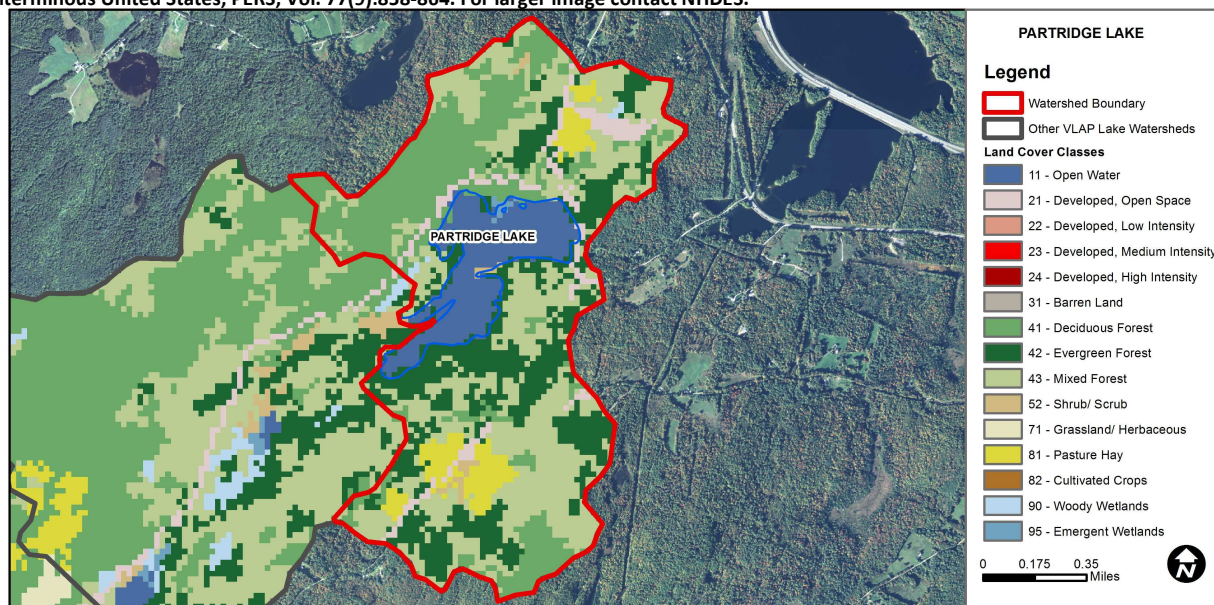
### KNOWN EXOTIC SPECIES


The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at [www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm](http://www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm)

Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator and the chlorophyll a indicator is okay.
	pH	Slightly Bad	>10% of samples exceed criteria by a small margin (minimum of 2 exceedances).
	Oxygen, Dissolved	Encouraging	There are < 10 samples with 0 exceedances of criteria. More data needed.
	Dissolved oxygen satura	Slightly Bad	There are >10% of samples (minimum of 2), exceeding criteria.
	Chlorophyll-a	Good	The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator.
Primary Contact Recreation	Escherichia coli	Very Good	Where there are no geometric means, all bacteria samples are < 75% of the geometric mean. Where there are geometric means all single bacteria samples are < the SSMC and all geometric means are < geometric mean criteria.
	Cyanobacteria hepatoto	Slightly Bad	Cyanobacteria bloom(s).
	Chlorophyll-a	Good	There are at least 10 samples with one, but < 10% of samples, exceeding indicator.

### WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.



Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	10.3	Barren Land	0	Grassland/Herbaceous	0
Developed-Open Space	4.41	Deciduous Forest	21.65	Pasture Hay	5.02
Developed-Low Intensity	0	Evergreen Forest	23.15	Cultivated Crops	0
Developed-Medium Intensity	0	Mixed Forest	33.72	Woody Wetlands	0.25
Developed-High Intensity	0	Shrub-Scrub	0.71	Emergent Wetlands	0.25



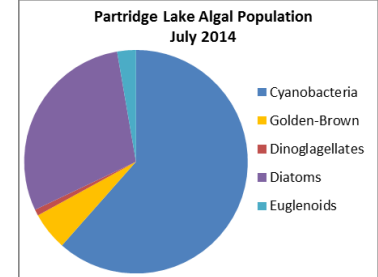
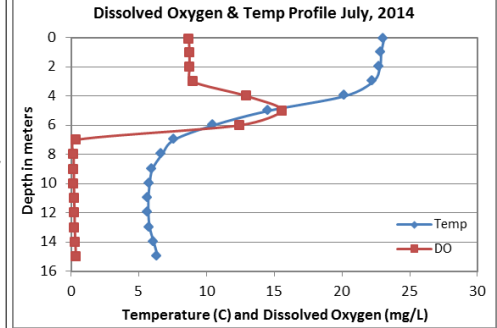
# VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS

## PARTRIDGE LAKE, LITTLETON

### 2014 DATA SUMMARY

#### OBSERVATIONS AND RECOMMENDATIONS (Refer to Table 1 and Historical Deep Spot Data Graphics)

- **CHLOROPHYLL-A:** Chlorophyll levels were elevated and greater than 15.0 ug/L in June indicating an algal bloom had occurred. Chlorophyll levels decreased to slightly above average levels in July and remained stable in September. Historical trend analysis indicates highly variable chlorophyll levels since monitoring began.
- **CONDUCTIVITY/CHLORIDE:** Deep spot conductivity remained slightly elevated and greater than the state median, however historical trend analysis indicates stable epilimnetic (upper water layer) conductivity since monitoring began. Tributary conductivity levels were slightly elevated as well but were within average ranges for those stations.
- **E. COLI:** Inlet 1 E. coli levels were slightly elevated in June and elevated in September following significant storm events, however levels did not exceed the state standard of 406 cts/100 mL. This suggests a localized source of E. coli such as domestic animal waste, wildlife and/or a small agricultural operation.
- **TOTAL PHOSPHORUS:** Epilimnetic phosphorus levels were relatively low in June and July and increased to average levels in August. Average epilimnetic phosphorus increased slightly from 2013 and was less than the state median. Historical trend analysis indicates significantly decreasing (improving) epilimnetic phosphorus since monitoring began, we hope to see this continue! Metalimnetic (middle water layer) phosphorus was elevated and increased as the summer progressed. Hypolimnetic (lower water layer) phosphorus levels were also elevated and increased greatly as the summer progressed and dissolved oxygen levels were depleted to less than 1.0 mg/L. A process called internal phosphorus loading. Inlets 1, 10 and 6 all experienced slightly higher phosphorus levels following the June significant storm event. Inlet 10 and 6 phosphorus levels decreased to low to average levels in July and September. Inlet 1 phosphorus levels remained elevated in July and September. Outlet phosphorus levels were low in July.
- **TRANSPARENCY:** Transparency was good in June, despite the algal bloom. This suggests that a layer of algae and/or cyanobacteria in the Metalimnetic likely contributed to the elevated chlorophyll levels but did not impact water clarity. Transparency decreased (worsened) in July when cyanobacteria became more apparent in the water column, and then increased (improved) in August. Average transparency improved slightly from 2013 and was better than the state median. Historical trend analysis indicates relatively stable transparency with moderate variability between years.
- **TURBIDITY:** Epilimnetic turbidity was low on each sampling event. Metalimnetic turbidity was elevated and increased as the summer progressed, and Hypolimnetic turbidity was greatly elevated and increased as the summer progressed and organic compounds accumulated as dissolved oxygen levels depleted to less than 1.0 mg/L. Inlets 1, 10 and 6 experienced elevated turbidities following the June significant storm event. Inlets 10 and 6 turbidities decreased to low levels in July and September, however Inlet 1 turbidity remained slightly elevated.
- **pH:** Deep spot and tributary pH levels remained within the desirable range 6.5-8.0 units. Historical trend analysis indicates relatively stable epilimnetic (upper water layer) pH with moderate variability between years.
- **RECOMMENDED ACTIONS:** The early summer algal bloom could have been caused by winter dissolved oxygen depletion in the water column. If winter anoxic conditions exist, this could cause the release of phosphorus from bottom sediments, similar to what occurs during the summer months. When spring turnover occurs, nutrients are available for algal growth. If possible, measure winter dissolved oxygen levels under the ice. DES may have a dissolved oxygen meter to loan you for this purpose. The improving epilimnetic phosphorus levels are a great sign and likely the result of watershed management efforts to reduce nutrient loading. However, Inlet 1 phosphorus and turbidity levels were elevated following a significant storm event in June and remained elevated during the summer. Stormwater management techniques should be installed in this sub-watershed to help reduce the impact of stormwater runoff. Keep up the great work!



**NH Water Quality Standards:** Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.

**Chloride:** > 230 mg/L (chronic)

**E. coli:** > 88 cts/100 mL – public beach

**E. coli:** > 406 cts/100 mL – surface waters

**Turbidity:** > 10 NTU above natural level

**pH:** between 6.5-8.0 (unless naturally occurring)

**NH Median Values:** Median values for specific parameters generated from historic lake monitoring data.

**Alkalinity:** 4.9 mg/L

**Chlorophyll-a:** 4.58 mg/m<sup>3</sup>

**Conductivity:** 40.0 uS/cm

**Chloride:** 4 mg/L

**Total Phosphorus:** 12 ug/L

**Transparency:** 3.2 m

**pH:** 6.6

Station Name	Table 1. 2014 Average Water Quality Data for PARTRIDGE LAKE							
	Alk. mg/l	Chlor-a ug/l	Cond. uS/cm	E. Coli #/100ml	Total P ug/l	Trans. m		Turb. ntu
						NVS	VS	
Epilimnion	22.8	11.66	67.9		8	4.62	4.10	0.91
Metalimnion			78.3		21			3.43
Hypolimnion			88.1		77			8.54
Inlet 1			83.2	250	28			2.64
Inlet 10			89.4		10			2.19
Inlet 6			92.3		15			2.32
Outlet			69.0		7			1.01

#### HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Stable	Trend not significant; data show low variability.	Chlorophyll-a	Stable	Trend not significant; data highly variable.
pH (epilimnion)	Stable	Trend not significant; data moderately variable.	Transparency	Stable	Trend not significant; data moderately variable.
			Phosphorus (epilimnion)	Improving	Data significantly decreasing.

